# "Fish Diversity, Productivity and Fisheries Management Status of Asolamendha Reservoir, Maharashtra State"

**A**
**Synopsis**
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**Short resume/Synopsis of Ph.D. Topic**

**Name of topic: Fish diversity, Productivity and Fisheries Management Status of Asolamendha Reservoir, Maharashtra State**

1. **Abstract of proposed plan/problem:-**

Reservoirs, the 'man-made lakes' covering more than 1% of the country's land surface are created primarily for irrigation, power generation and other water resource development purposes. These water-bodies have become the prime inland fisheries resource of India due to many reasons. Development of reservoir fisheries has many economic and social advantages. The marine capture fisheries are fast approaching a plateau and the inland aquatic ecosystems like rivers face degradation due to anthropogenic habitat changes. The aquaculture development projects are capital intensive and constrained by many environmental risks. In view of these and considering the enormous resource size and untapped production potential, the reservoirs have become the focus of future fisheries development plans in India. Nearly half of the projected demand of 3 million tonnes of additional fish by the end of 2020 may come from the reservoirs. Thus, national efforts to enhance fish production from India have to rely heavily on reservoirs. However, application of technologies and creation of an enabling governance environment would be needed to achieve the optimum production from the reservoirs (Ayyappan *et al.,* 2011).

The post-independence period has witnessed commissioning of a number of small medium and large river valley projects leading to creation of a chain of impoundments in form of reservoirs. About 3.15 million ha constitute reservoir area in India, which was reported earlier also by the National Commission on Agriculture. There are 19370 reservoir (including large irrigation tanks) spread over in 15 state and covering an area of 3,153,366 ha forms the most important inland open water fishery resource of our country. The area under reservoirs is expected to reach 6.0 million ha in another two decades. The present fish production from reservoirs is estimated at 0.94 lakh tonnes, with over 79% contribution of small reservoirs, followed by large (14%) and medium (7%). At present level of management and utilisation, they yield an average of 20 kg/ha/year, which is far below the potential. Though much higher per ha fish productions are possible, even a moderate increase of 100 kg/ha for small and 50 kg/ha for medium and large reservoirs can provide an additional

increment of 1.65 lakh tonnes of fish (Valued at Rs. 49.50 lakh @ Rs. 30/- per kg). Therefore, reservoirs are one of the most potential fisheries resources for future fisheries development in our country (Anon, 2001).

The fish production statistics from inland sources are inaccurate all over the world due to many reasons and reservoirs are no exception to this. Nevertheless, it has been established that the fish yield from Indian reservoirs is rather poor varying from 0.05 kg/ha in Bihar to 35.5 kg/ha in Himachal Pradesh with national average of 20 kg/ha. The average national yield from small reservoirs in India is nearly 50 kg/ha, which is well below the rates achieved in many other countries such as >800 kg in China, 300 kg in Sri Lanka and 100 kg/ha in Cuba (Ayyappan *et al.,* 2011).

Prioritizing culture-based fisheries of reservoirs hold the key for increasing inland fish production in India. Based on the average fish yields of 422 reservoirs, it has been estimated that small, medium, and large reservoirs yield fish at the rate of 49.50 kg/ha, 12.30 kg/ha and 11.43 kg/ha respectively. Applying this at national scale, fish production from 1,485,557 ha of small, 507,298 ha of medium and 1,160,511 ha of large reservoirs, could be 74,129 tonnes, 6,488 tonnes and 13,033 tonnes from small, medium and large reservoirs respectively. But, with moderate increased yield rate of 500, 250 and 100 kg/ha for small, medium and large reservoirs respectively, the production is expected to be 743,000, 127,000 and 116,000 tonnes for small, medium and large reservoirs respectively. Cumulatively this would boost up the present production of all reservoirs (Ayyappan *et al.,* 2011).

Anomaly regarding classification and nomenclature of impounded water-bodies, which have existed for long time, has now been sorted out by general consensus during the National Commission held at the CIFRI, Barrackpore, in January 1997. All man-made impoundments created by erecting dam on a river, stream or any water-course have been named as reservoirs. Water-bodies less than 10 hectares are excluded. It has also been agreed to classify uniformly reservoirs of the country into small (<1,000 ha), medium (above 1,000 to 5,000 ha) and large (>5,000 ha) based on their hectarage. Prior to that also classification of the reservoirs given in the records of Government of India was the same as given above (Ayyappan *et al.,* 2011).

Maharashtra State, one of the largest states of India, it occupies a substantial portion of the

Deccan Plateau in the western part of the subcontinent. It is the third most populous state in India spreading over an area of 307,713 square kilometers. The state is bound by the Arabian Sea in the west, Gujarat in the north-west, Madhya Pradesh in the north, Andhra Pradesh in the south-east, and Karnataka and Goa in the south. State has around 3,18,000 ha water spread area in the form of tanks, reservoirs, lakes etc., and around 19,500 kms stretch of rivers is the potential area for inland fishery. To exploit these resources to the full potential 60 Cr. carp fish fingerlings is the prime requirement (DoF, Maharashtra).

Further, importance of reservoir fisheries lays its potential on fish diversity and productivity which helps improving the socio-economic status of the fishing/farming communities around the reservoir regions, through regular and sustainable employment. This can only be achieved by the effective management practices and higher fish production from the reservoir, within an appropriate governance framework. So the study would help to understand the different institutional framework existing at the selected reservoir regions, various problems during the management phase and fish abundance. This would help policy makers, administrators, researchers and extension personnel to find out the ways and means to strengthen the existing fisheries policy in the selected reservoir region.

## 2. Review of literature and development in the subject:

(Previous work done in relevant area)

### a) Fish diversity and Productivity

India is one of the mega biodiversity countries in the world and occupying ninth position in terms of freshwater biodiversity (Mittermeier, R.A., Mitemeir, C.G., 1997). There are about 450 families of freshwater fishes globally. Roughly 40 are represented in India (warm freshwater species). About 25 of these families contain commercially important species. Number of endemic species in warm water is about 544. Freshwater fishes are a poorly studied group since information regarding distribution, population dynamics and threats is incomplete, and most of the information available is from a few well-studied locations only (Chaudhuri, S.K.,2010).

India's inland water resources are diversified, as they are plentiful. Reservoirs contribute the single largest inland fishery resources both in terms of size and production potential4. Fish fauna of a reservoir basically represents the fish diversity and their abundance. Indian reservoirs preserve a rich variety of fish species, which supports to the commercial fisheries.

Fish species are also an important indicator of ecological health. The abundance and health of fish will show the health of water bodies (Hamzah N., 2007).

The objectives of the present study were to document the fish diversity and productivity in Isapur reservoir and suggest appropriate conservation and management strategies to other reservoirs like, Nath Sagar Dam, Maharashtra 43 fish species reported by Hiware, C.J. and Pawar, R.T.,2006, Govindsagar reservoir, Himachal Pradesh 51 fish species reported by Kumar K., 1990, Bori reservoir in Maharashtra 21 fish species reported by Sakhare, V. B. and Joshi P. K., 2002, Rawanwadi Lake, Maharashtra 29 fish species reported by Kalbande *et al.*,2007, Rana Pratap Sagar Lake, Rajasthan 39 fish species reported by Verma *et al.,2007*, Gandhi Sagar Reservoir, Madhya Pradesh 72 species of fishes belonging to 9 orders, 20 families and 43 genera reported by Ridhi *et al*., 2013 etc. (Keshave *et al*.,2013)

The present productivity of the Isapur reservoir was worked out to be 64.05 kg/ha/year, which is very good as compared to national average catch from large reservoir i.e. 11.43 kg/ha/yr18 and other reservoirs as opinioned by Srivastava, A. and Tamot, P.,2002, Pong dam 4.1 to 25.08 kg/ha/yr, Rihand – 3.7 to 14.24 kg/ha/yr, Tenughat – 0.53 to 1.471 kg/ha/yr, Kangsabati – 0.55 to 1.10 kg/ha/yr, Kodana 6 kg/ha/yr. Gandhisagar 0.52 to 13.3 kg/ha/yr, Santhamur 3.5 to 11 kg/ha/yr, Tungabhadra 5.54 kg/ha/yr. Pilit 08 – 35.30 kg/ha/yr and Shardarsagar 42 to 56 kg/ha/yr. The fish production of 7 kg/ha/yr in Nizamsagar, 8 kg/ha/yr in Bhadha and 6 kg/ha/yr in Panam reservoirs. The present fish production was much less than Indian and different states reservoirs average production. The present production was many times less than the average fish productivity in Indian reservoirs, 29.70 kg/ha/yr. Dehadrai, 2001 & Gowda, 2002, recorded only 15.6 kg/ha/yr in Hirakud reservoirs and 5.10 kg/ha/yr in other major reservoirs in Orissa and concluded that there was scope for increase the yield rate to 100 kg/ha/yr by proper management cited in Kamble, A.T. and Mudkhede, L.M.,2013. Still there is enough scope for increasing fish production from Isapur, which could be easily achieved by scientific management practices. (Keshave *et al*.,2013)

b) **Reservoir fisheries development and management**

Nangmaithem Bijaya Lakshmi, D., (2011) In her study on Study of Fishers' Livelihood and Fisheries Management in Loktak Lake Region of Manipur stated that, proper fishery

management policies, effective input supply, technical and social support may improve the livelihood of the fishers and also enhance the fish production.

According to Fernando (1980), Reservoirs are never impounded for fishery development. But fisheries are beginning to be recognized as an important secondary user of reservoir water resources. In certain instances, it is reported that the income from the fishery exceeds that from the intended primary function of the reservoir, such as for example in Ubolratana reservoir, Thailand.

De Silva (1988b), pointed out that it would not be meaningful to stock large, perennial Sri Lankan reservoirs because of the low returns and because profitable, self-sustaining fisheries already exist. One wonders whether it would be profitable to avoid the traditional stocking practices adopted elsewhere and explore other useful means of optimizing the yield from reservoirs, particularly in the tropical part of the Southeast Asian region.

Fisheries management draws on fisheries science in order to find ways to protect fishery resources so sustainable exploitation is possible. Modern fisheries management is often referred to as a governmental system of (hopefully appropriate) management rules based on defined objectives and a mix of management means to implement the rules, which are put in place by a system of monitoring control and surveillance (Anon, 2010).

The aim of this study is to identify fish diversity, productivity and fisheries management status of Asolamendha reservoir.

**3. Objective of Research / Proposed hypothesis :**

- To study the fish diversity and productivity of Asolamendha Reservoir, Maharashtra State
- Calculation of total productivity of Asolamendha Reservoir
- To study the fisheries management system, fish production and utilization pattern of Asolamendha reservoir, Maharashtra State

4. **Methodology to be adopted :**

The Asolamendha Reservoir (1746 ha), located in Chandrapur District of Maharashtra has selected to study the fish biodiversity, productivity and fisheries management system. Fish sampling will be done at four selected landing centres of reservoir using available gears and the commercially important species were only taken into consideration. The selected

landing centres will represents all the three stretches of the reservoirs i.e. Lower, Middle and Upper. The fishes will either collected personally or fishermen will instructed to collect during every sampling operation and preserved in 5% formalin solution for further studies. Fishes will be identified based on standard taxonomic literature, Day, F., 1889, Misra, K.S., 1962, Qureshi *et al*., 1983, Talwar et al. 1991 and Jayram, K.C., 1999 and grouped into two categories based on their abundance viz.,Major and Minor.

- The fish productivity will be calculated by using following formula given by ( Agarwal, S. C., 1990)

P = NS

Where, P = Fish Productivity (kg/ha/yr)

N = Constant including natural mortality 0.25 and accidental mortality 0.40 i.e. 0.65

S = Number of fish seed stocked per hactor per year

The study would also follow a random sampling study cum survey method. It would be conducted in four landing centres of Asolamendha reservoir. In order to draw meaningful conclusion, the statistical tools that will be used are percentage analysis to make simple comparison whenever necessary and other relevant statistical tools as per the requirement of the study. The secondary data will be collected from the Department of Fisheries, MFDC, and Fishermen Co-operative Society etc.

5. **Importance of study / Society application:**

❖**National status:**

A reservoir fishery has been identified as one of the engines of future growth in India. Since literature on effective governance, institutional framework and sustainable management practices of Indian reservoirs were scanty, the present study documented the fisheries and management status of Itiadoh Reservoir. IMC were dominating the fishery followed by exotic carps, catfishes, snakeheads, tilapia and spiny eels. Annual fish production during 2011-12 (Study period) was 95,412.5 kg and the productivity was 18.4 kg /ha/yr. Gill net was the only gear employed to exploit fishery of reservoir. It was observed that banned season does not exist in Itiadoh reservoir. Reservoir produce was mainly marketed through Vidarbha Vibhagiya Machhimar Sangh Limited, Gondia a Department of Fisheries affiliated marketing agency in the region. The reservoir needs immediate attention for development

of fisheries in a scientific and sustainable manner to augment the fish production. (Keshave *et al*., 2014)

Reservoirs can emerge as one of the most vital components of inland fishery resources of India with gargantuan potential not only to enhance the country's inland fish production but also in providing food and nutritional security to the people, besides providing opportunities for livelihood and employment generation. Reservoirs are human-engineered habitats that occur in almost all major river basins. India has 19,370 reservoirs spread over 15 states with an estimated 3.15 million ha surface area at full capacity, and this is expected to increase due to execution of various water projects in the country (NFDB, 2011).

In spite of this fact, reservoir fish production has been treated as a by-product and reservoir fisheries have not made significant progress in the country (Vass and Sugunan, 2009).

❖**International status:**

It is a fact that inland fisheries sector has become the mainstay of increasing fish production in the country and this trend is expected to continue in future also. Although the major chunk of this production is projected from aquaculture, but increase in fish production from inland capture/open-water ecosystems is also expected in a big way. It needs to be examined as to how inland open-water fishery can contribute to this target and what could be its future role. Considering constant or net decline in fish catch from rivers over the years, measures are necessary for efficient and generous utilization of river associated systems for fisheries to enhance the fish production, productivity and livelihoods for the inland fishers. At many fora, reservoirs are recognized as the sleeping giant and most important water resource for inland fisheries development in the country. Thus, any attempt to increase productivity in inland fisheries has to rely heavily on reservoirs (NFDB, 2011).

These water-bodies have become the prime inland fisheries resource of India due to many reasons. Development of reservoir fisheries has many economic and social advantages. The marine capture fishery is fast approaching a plateau and the inland aquatic ecosystems like rivers face degradation due to anthropogenic habitat changes. The aquaculture development projects are capital intensive and constrained by many environmental risks.In view of these and considering the enormous resource size and untapped production

potential, the reservoirs have become the focus of future fisheries development plans in India (Ayyappan *et al.*2011).

**6. Significance of the study:**

- The study would help to identify the fish diversity and productivity of Asolamendha reservoir.
- The study also aims to understand the fisheries management systems, fish production and utilization pattern in Asolamendha reservoir.
- Study would help policy makers, administrators, researchers and extension personnel to find out the ways and means to strengthen the existing fisheries policy in the selected reservoir region.
- Study would also help to understand the various problems and suggested solutions from fishers' perspective.

The finding will be present in the form of thesis.

**7. Proposed work plan / formulation and structure of study:**

Year wise plan of work and targets to be achieved:

| Sr.no. | Activities | Period in months |
|---|---|---|
| 1. | Preparation and submission of synopsis, Literature review and introductory visit to the study area and selection of sampling stations. | First Year |
| 2. | Fish Sampling at selected landing centers of reservoirs, collection and identification of fishes, Secondary data collection etc. | Second Year |
| 3. | Analysis of data, Writing and submission of thesis. | Third Year |

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